

Export of Production and the Displacement of Effort from Marine Reserves: Effects on Fisheries and Monitoring Programs

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Abstract: Marine reserves affect areas outside reserve boundaries via the displacement of fishing effort and the export of production. Here we focus on how these key factors interact to influence the results seen once reserves are created. For a settlement-limited fishery, export of increased production from within reserves can offset the effects of displaced fishing effort. Given documented average increases in biomass within reserves, simple models indicate that net fisheries benefits can accrue at closures up to and perhaps beyond 50% of total stock area through the export of production. However, reserve monitoring programs face problems identifying independent control sites because the spatial extent of export is unknown. Efforts to monitor reserve impacts on recruitment are further complicated by the fact that large reserve closures are likely necessary before significant changes in recruitment can be detected above normal interannual fluctuations. Resolving these limitations requires comprehensive monitoring data before reserves are implemented. Fortunately, studies of reserves that used BACI experimental designs show that control and reserve sites were equivalent prior to protection, and that control sites improved after reserves were in place. Consequently, any bias in our current perception of reserve impacts likely underestimates their effect.